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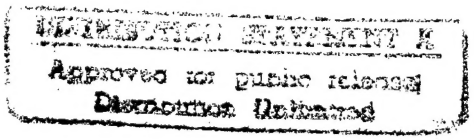

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Major Dean A. Nowowiejski, the author of the following article, served as opertions officer (S3) of 3-8 Cavalry (1st Cavalry Division) during transition to the M1A2 and during National Training Center Rotation 93-10.

Achieving Digital Destruction: Challenges for the M1A2 Task Force

by Major Dean A. Nowowiejski

(January-February 1995)

In 1993, Task Force 3-8 Cavalry in the 3d Brigade, 1st Cavalry Division, underwent new equipment training, qualification gunnery, NTC Rotation 93-10, and an initial operational test and evaluation with 17 M1A2 tanks. Most of the capabilities of the M1A2, and results of this experience have been discussed in other articles.(Note 1) The M1A2 brings the armor force digital command and control through its incorporation of the Intervehicular Information System (IVIS) and Position Navigation (POSNAV). These systems, in conjunction with the Commander's Independent Thermal Viewer (CITV) and onboard diagnostics, give the M1A2 task force significant advantages.(Note 2) Battlefield awareness improves in terms of both friendly and enemy locations. So does positive control, even as operations increase in tempo and precision. The M1A2 task force can quickly disseminate information, reports, and graphics, consolidate on the move, and change missions. The M1A2 gives the task force the equivalent of automated task force fire planning, plus the ability to mass fires with less fratricide. Because of internal diagnostics and IVIS, combat service support status is more exact and more quickly reported. The literature on the M1A2 so far has emphasized what the tank can do. To be balanced, we need to consider not only the tank's potential for task force operations, but also what challenges professional soldiers face in reaching its full capability. This article will focus on some issues we must confront to take advantage of the M1A2 as the Army transitions to information warfare and the digitized battlefield.

IVIS Limitations. The Intervehicular Information System relies on a specific protocol for routing messages and overlays, based upon the user identifications within the net. **(See Figure 1** for an example of an IVIS display.) Several limitations in this protocol and in IVIS symbology could be overcome with software revisions.

Some of the needed changes are beyond the user's control. The routing matrix is the first restriction which might be addressed. Only two of the IVIS overlays allow changes in graphics to flow upward through the chain of command. It is impossible for the company commander or battalion S3 to send refinements of operations overlays to the battalion commander.(Note 3) The Task Force 3-8 commander had to assume the IVIS user ID of a company commander so that he could receive graphics from his company team commanders. Likewise, the TOC at times used the ID of the task force commander or S3, since there is not a user ID for the TOC. Most of the routing matrix limitations can be bypassed by creative use of alternate user IDs, but this makes for a slow, ungainly procedure. In the end, the matrix should be revised by means of a software change to parallel doctrinal procedures governing the exchange of information.

Similarly, the current military symbols in the IVIS protocol do not fully parallel those of Field Manual 101-5-1, Operational Terms and Symbols. The IVIS screen quickly becomes congested through overuse of the point symbol, whereas a standard military overlay should be kept uncluttered. **(See Figure 2,** Comparison of IVIS and Standard overlays.) Another thing that would help alleviate this IVIS clutter is to make the symbols smaller.(Note 4) Ideally, the IVIS overlay will evolve into an easy to read, streamlined version of the operations overlay using standard military symbols.

The amount of time that it currently takes to load a complete task force operations overlay into IVIS calls for further consideration. To be timely, the operator must begin input as soon as draft graphics are approved. Furthermore, it takes some time for an operator to develop the proficiency to quickly and accurately enter that data. In Task Force 3-8, two of the best sergeants in the operations section took this responsibility as a full-time job. Perhaps in the future there will be a tactical computer operator MOS for a soldier who is specially trained in information warfare devices like IVIS. Tactical computer training

a soldier who is specially trained in information warfare devices like IVIS. Tactical computer training and input are an increasingly important operational concern.

Command, Control and Communications Net Demands. In 3-8 Cav, the IVIS net was the task force command net (the Alpha and Delta Team nets were also digital). During the NTC rotation, the task force commander, S3, all maneuver commanders, platoon leaders in Alpha and Delta teams, and the TOC all had IVIS. With this distribution of equipment, task force command and control could be exercised digitally.

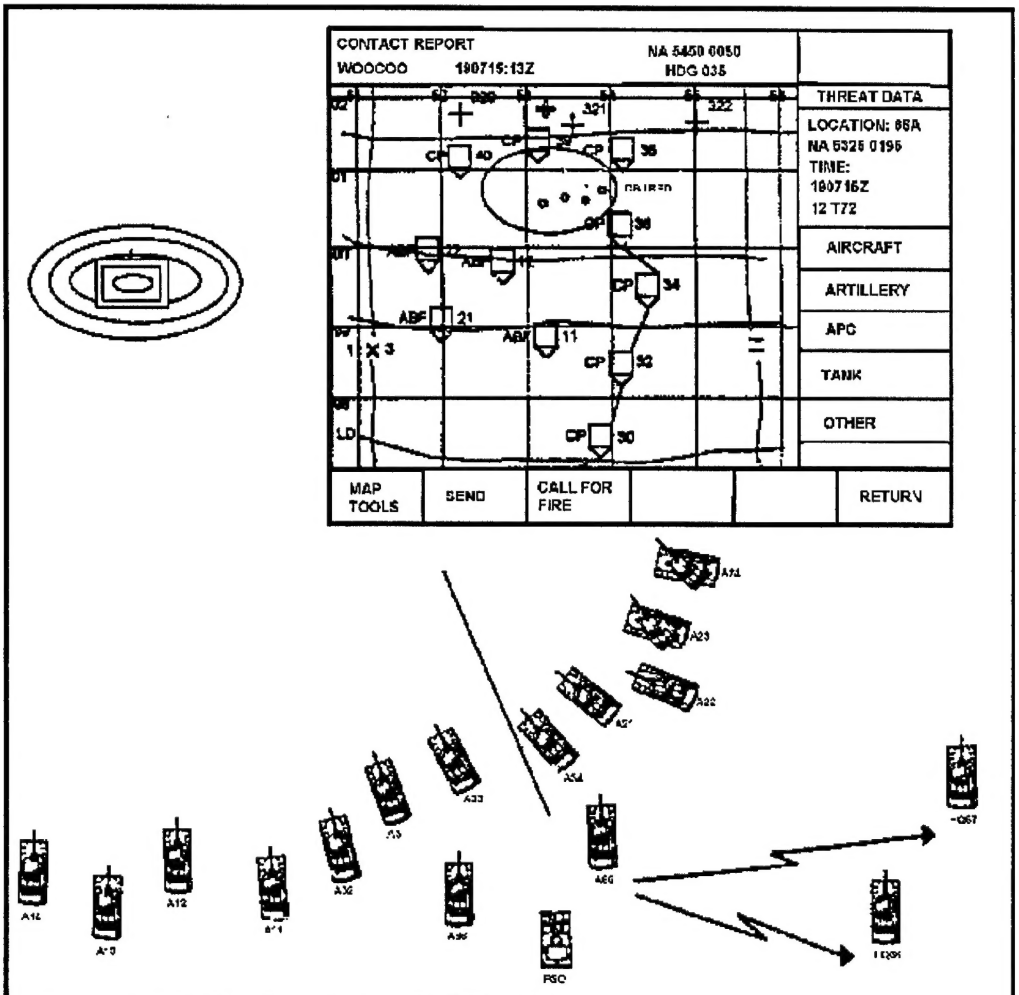

Figure 1. IVIS Display of a Tactical Situation.
Note how net subscribers are depicted by open circles on screen.

While the M1A2 improves many aspects of command and control, it also imposes new demands. Strict adherence to standard operating procedures (SOPs) is a challenge of renewed importance. The time required to keep the IVIS system updated has already been mentioned. As with any new system with complex user requirements, IVIS depends upon soldiers who understand its protocols, standard reports, and overlay manipulation. Refined procedures must become matters of SOP. SOPs provide standards for managing reports and files, and suggest whether to send a digital or voice message in a given circumstance, a critical decision since both types of traffic currently share the same net. Standard operating procedures allow the task force to navigate through the complexities of IVIS.

One of the biggest problems that Task Force 3-8 experienced at the National Training Center was the difficulty of keeping all stations on the digital net due to linkup problems. The initial linkup procedures require a silent voice net for several minutes, until all subscribers are in the digital net. The same condition applies to users who must reestablish commo. Reentering the digital net is often difficult during active operations; there is too much traffic on the net. It is unrealistic in a tactical environment to

during active operations; there is too much traffic on the net. It is unrealistic in a tactical environment to expect the lengthy silence required during linkup.

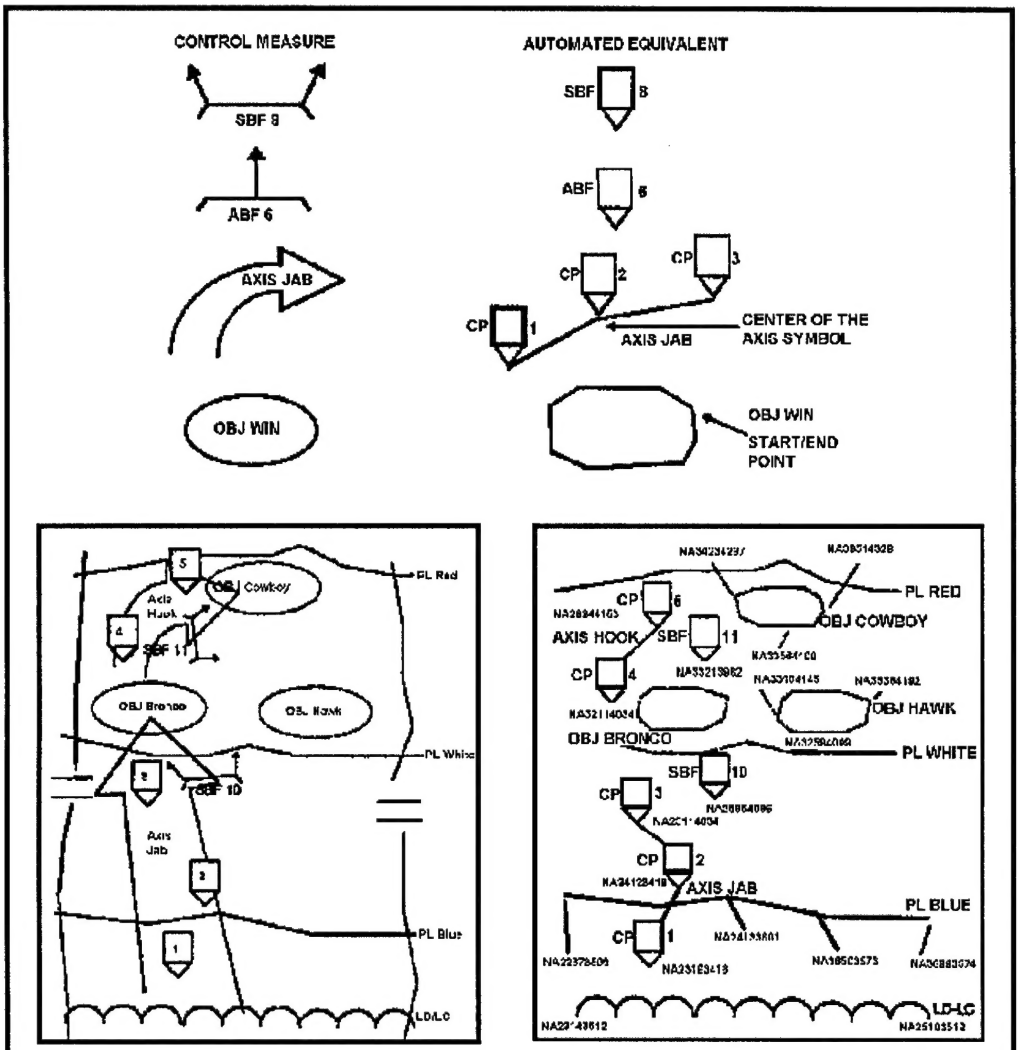

Figure 2. Comparison of standard graphic symbols and overlay to IVIS symbols and overlay.

This also means IVIS is not user- friendly in a hostile electronic countermeasures environment. If stations have difficulty linking up in a training environment, one can just imagine how few stations will remain digitally linked in a high-intensity, contact situation where the enemy frequently jams the task force net and forces frequency changes. This problem may best be remedied by a software change.

The addition of digital traffic to the task force command net, including digital calls for fire and medevac requests, makes the net an incredibly busy place. During maneuver operations, many digital messages will never get sent because messages wait in queue until they expire. There is an obvious need for strict command net discipline in M1A2 units.(Note 5) But net discipline can only go so far. The best solution would be a separate digital net. Perhaps the hardware can be reconfigured to take advantage of SINCGARS' frequency-hopping capability and allow the same radios to fill the need for separate voice and digital task force command nets.

The current IVIS protocol calls for call signs to be used as station identifiers for digital messages, but one lesson learned by TF 3-8 was that it is easier to establish a set of standard identifiers, such as bumper or position numbers, in place of changing call signs, so that there is less confusion about the identity of subscribers or their locations (recall that the IVIS screen shows an icon for each net subscriber). Each user should always use a standard IVIS identifier, so that there is quick recognition on

subscriber). Each user should always use a standard IVIS identifier, so that there is quick recognition on the IVIS screen.

Current tactics, techniques, and procedures also call for the command net to revert to voice when enemy contact is made.(Note 6) This eases the burden of digital traffic on the already crowded net, but foregoes some of the unique advantages that the IVIS system brings to units in contact. Examples are far target designation to create initial contact reports, and the use of digital calls for fire and medevac requests. Some would argue that the policy should be reversed, giving primacy to digital rather than voice communications during contact.(Note 7) The point is that, because of the concept of sharing a common net, voice-only transmissions during heavy contact miss some of the unique advantages, accuracy, and precision of digital communications.

Finally, there is the situation of the IVIS-equipped tank platoon leader in a non-IVIS-equipped Bradley mech team. As currently written, the TTP envisions the tank platoon leader as a kind of translation station, relaying information received digitally to his mech team commander.(Note 8) Putting the subordinate in the position to screen key battlefield information for his superior is awkward; there is potential loss of information in the IVIS to voice transition; and there is risk of breaks in contact caused by battlefield dispersion. The long-term solution is the IVIS-equipped Bradley, which was provided in prototype during NTC rotation 93-10. Yet the challenge remains: in many units during the early fielding of the M1A2, there will be a need for innovative techniques to integrate IVIS-equipped elements into non-IVIS maneuver elements, and vice-versa.

Operational Impacts and Training Needs. Unique operational situations and training needs are already apparent for the M1A2. First, because of the wealth of information on the commander's integrated display (CID), there is a tendency for the tank commander to become focused on the CID, to the point of staring at the screen when he should be scanning the battlefield from the TC's hatch. This dilemma can be eased by training the loader to observe the CID from his crew position, and to alert the tank commander of any critical incoming reports. Even with that adjustment, the TC will have to develop an intuition about when to work the CID and when to command from above.

In the TOC particularly, there is a need for extensive cross-training in IVIS-related skills, both in handling the terminal and processing and relaying information from IVIS. IVIS capability is like a foreign language skill -- it must be rehearsed and used to be maintained. Training for the NTC in TF 3-8 required multiple IVIS exercises focusing on the command group, TOC, and company team commanders, in order to develop and enforce standards of integration. IVIS employment is a consideration at task force rehearsals and during decision support template development. Decision points can be input into the IVIS overlay itself, using improvised symbology. The need for IVIS rehearsals of key parts of the operation, like breaching and the counterreconnaissance battle, became clearer over the course of the NTC rotation for 3-8 Cav.

Even with the advantages of modernization, there still remains the need to have a manual system to back up the digital information-processing one. In some respects, the ease of reporting and information processing afforded by IVIS carries with it the threat of over-reliance; we must keep in mind, for instance, that the whole complexion of task force command and control changes if the IVIS track in the TOC goes down.

Integration. IVIS tends to highlight already existing fault lines in task force operations -- the lines of integration where the battlefield operating systems meet. Many of these seams will vanish as digital systems that communicate across operating system lines are fielded, but for now they call for careful consideration.

The basic issue now is, "Who has IVIS and who doesn't?" Task force scouts, mech infantry, mortars, engineers, air defense, support platoon, and field trains all presently miss out on the benefits of digital technology.(Note 9) Until task force scouts can input their reconnaissance reports directly into IVIS, we essentially have a highly lethal task force main body with blind eyes. Mech infantry without IVIS Bradleys becomes the weak sister on the digital maneuver battlefield. Mortar fire power just can't keep up with the operational tempo of the M1A2 using old manual methods. The Enhanced Mortar Fire Control System (EMFCS) fixes this problem for the task force commanders by linking task force

Control System (EMFCS) fixes this problem for the task force commanders by linking task force mortars to IVIS, and "returns the mortar to its place as the commander's initial indirect fire weapon of choice" on the digital battlefield.(Note 10)

One of the most significant challenges for the M1A2 task force will be to create a digital link to field artillery fire direction systems. Digital calls for fire should enter the field artillery database directly, without being manually relayed inside the task force TOC. This will speed the process, improve synchronization with fire support, and eliminate potential inaccuracies created by manually relaying fire direction data.

Similarly, providing the task force engineer with an input terminal and GPS will facilitate speedy transmission of data from the work site directly to the obstacle overlay. These improvements fit into the general need to integrate digital hardware across the battlefield operating systems, with artillery and engineers being those that might offer the most immediate positive impact at the task force level.

In the CSS arena, there is no IVIS capability for company team combat trains, support platoon, or field trains, so the benefits of CSS digital reporting are not evenly spread throughout the task force. Let's use the company team to illustrate the current challenges of CSS integration. The executive officer has enormous responsibilities as the integrator of company team IVIS CSS reports. He collates the separate platoon reports, inputs manual facts from non-IVIS elements, and forwards the consolidated report to higher. There is little help for him from the first sergeant, who has no IVIS, and this job is in addition to his responsibilities as second in command. The company team combat trains and field trains have no IVIS input capability. This means that the benefits of digital CSS reporting are principally limited to the maneuvering line platoons. Giving the first sergeant IVIS capability would go a long way toward more complete task force CSS integration.

The issue of integration impacts the fielding of the M1A2. For instance, if only leaders to platoon level have the tank, and platoon sergeants and wing men retain the M1A1, then integration challenges are felt in tank elements of the task force as well. To the author, this situation parallels the dilemma faced by armor theorists between World War I and II. How were they going to integrate armor and mechanized forces on the battlefield to take advantage of their full potential? The French and Americans elected to integrate a little everywhere.(Note 11) The Germans elected to create a combined arms force of rapid mobility and massed armor for the purpose of exploitation, the force used for blitzkrieg in Poland and France.

The parallel today is that digital technology possesses the same revolutionary impact that the tank did then. Let's not make this lethal warfighting machine a glorified digital communications platform by piecemeal fielding across the force. Wherever the M1A2 is fielded without a digital counterpart, there will be a seam in task force operations that requires reversion to old methods to accomplish synchronization. Task Force 3-8 had the requirement to conduct simultaneous planning and orders dissemination using both the old technique of paper copies and overlays and the digital capabilities of IVIS. In this respect, having only partial integration of M1A2 tanks created an increased burden. Though it will be some time before digital technology is totally integrated, this problem deserves special consideration. Digital weapons systems will have their greatest impact where they are used en masse.

Information Processing and Potential for Information Overload. While simplifying the mechanics of handling information, IVIS increases the burden of information processing. Using IVIS is like having to monitor an additional net in the TOC, while adding the requirement to capitalize on the unique capabilities which the system provides. TOC procedures now require handling information from standard FM nets, Maneuver Control System, and IVIS. As discussed earlier, this simultaneity makes standard procedures all the more important. An increased burden is placed on TOC information flow and overlay management.

There is a new sense of battlefield perception, on determining what the true picture is, because even though the reports are quicker and more accurate in detail, they increase the volume of information and pick up the pace of operations, while continuing the requirement for interpretation. In the M1A2 task force, instead of confusion on the battlefield being caused by absence of information, confusion can be caused by the sheer volume and clutter of data.

caused by the sheer volume and clutter of data.

We are need leaders who are capable of managing and interpreting large volumes of information. We must be able to make sense out of all the detail. The effective leader in an M1A2-equipped task force must sort through a profusion of IVIS reports, quickly decide which to delete, forward as is, or consolidate into another report. There is a sorting process involved; data is not automatically retransmitted. Leaders in the M1A2 task force must be comfortable with enforced standards and exact procedures, of life according to SOP, in order to facilitate time and information management. Increasingly, they must be familiar with computers, the management of files and manipulation of software. The days of the computer illiterate armor leader are going the way of the horse cavalry soldier.

Though the demand for well trained leaders and soldiers remains constant; the nature of training changes, and so do the qualities needed in all personnel. We must train and rehearse in all aspects of information warfare, to include incorporating technology such as the CITV and POSNAV, which work hand in hand with IVIS. All soldiers of the task force must be involved. Noncommissioned officers and enlisted soldiers converted standard overlay symbols to IVIS icons and created the IVIS overlays for Task Force 3-8. Loaders helped to monitor the commander's integrated display. Training with information systems increasingly demands innate intelligence and computer literacy, so that soldiers can accommodate changes, so they can handle rapid operations, and think on their feet. The M1A2 task force will place continuing emphasis on quality training of quality soldiers.

Notes

(1) Experiences from 3-8 Cavalry were described in three other articles:

Clark, Wesley K., Major General, "Digitization: Key to Landpower Dominance," Army, November, 1993, pp. 28-33;

Del Carlo, George H., Lieutenant Colonel, "A Glimpse of the Digitized Battlefield at the National Training Center," Landpower Essay 93-7, AUSA Institute of Land Warfare, October 1993. LTC Del Carlo's article focuses on the capabilities and advantages of the M1A2 tank itself;

McVey, Wade L., Captain, "The M1A2, IVIS, and NTC -- A Company Commander's Perspective," ARMOR, November-December 1993, pp. 35-37.

See also "Training on the Digitized Battlefield," ARMOR, January-February 1994, pp. 37-39.

Additionally, the following doctrinal literature has been used as a reference for this article:

Special Text 71-2-1 (Initial Draft), Tactics, Techniques, and Procedures for the M1A2 Battalion Task Force, U.S. Army Armor Center, Fort Knox, Ky., April 1993.

Special Text 71-1-1 (Final Draft), Tactics, Techniques, and Procedures for the M1A2 Company Team, U.S. Army Armor Center, Fort Knox, Ky., November 1992.

The author acknowledges the use of Figures 4-4, A-16, and A-20, ST 71-2-1, for the illustrations in this article. He also acknowledges the assistance of LTC James Forlenzo, Center for Army Tactics, Fort Leavenworth, who provided useful suggestions for editing this paper.

(2) A brief description of each of these systems follows:

The IVIS is a digital communications and display system that permits the transmission of reports and overlays over FM radio, to be displayed in each combat vehicle operating on a particular digital net. The system also permits the transmission of both voice and digital traffic over the same net, with voice taking precedence. While voice traffic is taking place, all digital transmissions are held for a temporary period in a queue, until there is a pause in voice communications. Then the digital burst is sent. If too much time passes, the digital message dies.

POSNAV is an inertially-updated position-locating system that initializes from a common start point obtained from a local global positioning system (GPS) receiver. POSNAV operates independently from GPS; it is a different system. The M1A2 tank driver uses POSNAV to set multiple waypoints in his driver's display panel and navigate from one to the next. The same system provides the tank commander an exact grid to his location on his commander's integrated display (CID).

With the CITV, the TC can independently scan the battlefield to acquire targets with an additional daylight or thermal sight, while the gunner engages targets on his own. The TC can independently range to the target using a choke sight included in his field of vision, and "target designate" his gunner on a target that was not even in his gunner's field of view by using a button on the TC's control handle.

There are three system-level diagnostic tests embedded in the M1A2's circuits; the self-test (ST), the built-in test (BIT), and fault isolation test (FIT). The ST is a non-intrusive test which runs continuously and displays a caution or warning message when a fault occurs or maintenance is needed. The BIT requires the crew to cease operations on the component which they are testing, but provides comprehensive diagnostics of that component and early notice of component problems. The fault isolation test is a unit maintenance level function that continues the same process of identification, but can render the tank immobile. (ST 71-2-1, p. 7-6)

(3) ST 71-2-1, pp. 2-16, 2-21.

(4) Del Carlo, p. 5.

(5) Further elaborated in "Training on the Digitized Battlefield," p. 39.

(6) ST 71-2-1, p. 2-19.

(7) Funk, Paul E., Major General, "The Right Technology at the Right Time," ARMOR, May-June 1993, pp. 5, 35. The quietness of a digital net during the Advanced Warfighting Demonstration of Battlefield Synchronization stood in direct contrast to the noise and confusion of a typical voice command net, yet the current M1A2 TTP calls for voice communications to take precedence.

(8) ST 71-2-1, pp. 1-2, 1-5.

(9) The exceptions of EMFCS and IVIS Bradleys have already been mentioned.

(10) Funk, p. 35.

(11) In 1932, Chief of Staff Douglas MacArthur directed that all branches continue to study the subject of mechanization, a piecemeal approach that avoided the decision whether the tank should be the primary responsibility of the infantry or cavalry.

Go to Next Article in the thread: Letter: Comunicate, Move, and Shoot When Necessary

Return to the Table of Contents

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09 May 1996/FDC
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